

CLAIMS

- 1 1. A method for proxying data access commands from a first storage system to a
2 second storage system in a storage system cluster, the method comprising the steps of:
3 receiving a data access command at the first storage system that is directed to the
4 second storage system;
5 forwarding the received data access command to the second storage system via a
6 cluster interconnect;
7 processing the data access command at the second storage system;
8 returning a response from the second storage system to the first storage system via
9 the cluster interconnect; and
10 sending a response to the data access command to the client from the first storage
11 system.
- 1 2. The method of claim 1 wherein the storage systems are storage appliances and
2 wherein the data access command is received at a proxy port associated with the first
3 storage appliance.
- 1 3. The method of claim 2 wherein the proxy port comprises a physical port.
- 1 4. The method of claim 2 wherein the proxy port comprises a virtual port associated
2 with a physical port.
- 1 5. The method of claim 1 wherein the response comprises requested read data.
- 1 6. The method of claim 1 wherein the response comprises an acknowledgement of a
2 write operation.
- 1 7. The method of claim 1 wherein the response comprises a predetermined set of
2 read data.

1 8. The method of claim 1 wherein the cluster interconnect comprises a direct link
2 between the first storage system and the second storage system.

1 9. A system adapted to proxy data access commands from a first storage system to a
2 second storage system connected via a cluster interconnect, the system comprising:
3 a virtual target layer interfacing with a virtual adapter on the first storage system,
4 the virtual target module adapted to make a forwarding decision of a received data access
5 request to thereby forward the request to the second storage system.

1 10. The system of claim 9 wherein the forwarding decision is based on a port to
2 which the data access request is directed.

1 11. The system of claim 10 wherein the forwarding decision is based upon a logical
2 unit address contained within the data access request.

1 12. A storage appliance for use in a storage appliance cluster for proxying data access
2 commands received at the storage appliance to a second storage appliance in a storage
3 appliance cluster, the storage appliance comprising:
4 a storage operating system executing on the storage appliance, the storage oper-
5 ating system including a virtual target module adapted to forward received data access
6 commands to the second storage appliance in the storage appliance cluster.

1 13. The storage appliance of claim 12 wherein the storage operating system further
2 comprising a virtual adapter that interfaces with the virtual target module and an inter-
3 connect driver for forwarding the received data access commands from the virtual target
4 module to the second storage appliance via a cluster interconnect managed by the inter-
5 connect driver.

1 14. The storage appliance of claim 13 wherein the cluster interconnect comprises a
2 fibre channel interconnect.

1 15. The storage appliance of claim 13 wherein the cluster interconnect directly con-
2 nects the storage appliance to the second storage appliance.

1 16. The storage appliance of claim 12 wherein the virtual adapter interfaces with a
2 virtual interface emulation layer to provide remote direct memory access capabilities for
3 transferring or forwarding received data access commands to the second storage appli-
4 ance.

1 17. A method for proxying data access commands in the first storage system to a sec-
2 ond system in a storage system cluster, the method comprising the steps of:
3 analyzing a received data access command at the first storage system,;
4 forwarding the received data access command to the second storage system; and
5 processing the received data access command at the second storage system.

1 18. The method of claim 17 further comprising the steps of;
2 returning a response from the second storage system to the first storage system;
3 and
4 sending a response to the data access command to the client from the first storage
5 system.

1 19. The method of claim 17 wherein the step of forwarding further comprises the step
2 of forwarding the data access command to the second storage system via a cluster inter-
3 connect.

1 20. The method of claim 19 wherein the cluster interconnect comprises a fibre chan-
2 nel link.

1 21. The method of claim 19 wherein the cluster interconnect comprises a direct link
2 between the first storage system and the second storage system.

1 22. The method of claim 17 further comprising the step of receiving the data access
2 command is at a proxy port of the first storage system.

1 23. The method of claim 22 wherein the proxy port comprises a physical port.

1 24. The method of claim 22 wherein the proxy port comprises a virtual port associ-
2 ated with the physical port.

1 25. The method of claim 18 wherein the response comprises requested read data.

1 26. The method of claim 18 wherein the response comprises an acknowledgement of
2 the write operation.

1 27. A computer readable medium, including program instructions executing on a
2 computer, for proxying data access commands from a first storage system to a second
3 storage system in a storage system cluster, the computer readable medium including in-
4 structions for performing the steps of:

5 receiving a data access command at the first storage system that is directed to the
6 second storage system;

7 forwarding the received data access command to the second storage system via a
8 cluster interconnect;

9 processing the data access command at the second storage system;

10 returning a response from the second storage system to the first storage system via
11 the cluster interconnect; and

12 sending a response to the data access command to the client from the first storage
13 system.

1 28. A system for proxying data access commands from a first storage system to a sec-
2 ond storage system connected via a cluster interconnect, the system comprising:
3 means for receiving a data access command at the first storage system that is di-
4 rected to the second storage system;
5 means for forwarding the received data access command to the second storage
6 system via a cluster interconnect;
7 means for processing the data access command at the second storage system;
8 means for returning a response from the second storage system to the first storage
9 system via the cluster interconnect; and
10 means for sending a response to the data access command to the client from the
11 first storage system.

1 29. The method of claim 28 wherein storage systems are storage appliances and the
2 data access command is received at a proxy port associated with the first storage appli-
3 ance.

1 30. The method of claim 29 wherein the proxy port comprises a physical port.

1 31. The method of claim 29 wherein the proxy port comprises a virtual port associ-
2 ated with a physical port.

1 32. The method of claim 28 wherein the response comprises requested read data.

1 33. The method of claim 28 wherein the response comprises an acknowledgement of
2 a write operation.

1 34. The method of claim 28 wherein the response comprises a predetermined set of
2 read data.